



Academic Year (2022-23)		
Year: 3 Semester: V		
Program: B. Tech. (Computer Engg)		Max. Marks: 75
Subject: Nature Inspired Computing (Honours)		Time: 10: 30 am to 1:30 pm
Date: 03/01/2022		Duration: 3 Hours

Instructions: Candidates should read carefully the instructions printed on the question paper and on the cover page of the Answer Book, which is provided for their use.

- (1) This question paper contains two pages.
- (2) All Questions are Compulsory.
- (3) All questions carry equal marks.
- (4) Answer to each new question is to be started on a fresh page.
- (5) Figures in the brackets on the right indicate full marks.
- (6) Assume suitable data wherever required, but justify it.
- (7) Draw the neat labelled diagrams, wherever necessary.

Question No.		Max. Marks
Q1 (a)	Explain the different types of immunity?	[05]
	OR	
Q1 (a)	Explain any 3 natural phenomena which have been used as an inspiration to create computational models.	[05]
Q1 (b)	Determine the weights after two iterations for Hebbian learning of a single neuron network starting with initial weights $w = [1, -1]$, inputs as $X1 = [1, -2]$, $X2 = [2, 3]$, $X3 = [1, -1]$ and $c=1$. Use bipolar continuous activation function.	[10]
Q2 (a)	State the weight change formula for the following learning rules 1) Perceptron Learning rule 2) Delta Learning rule 3) Correlation Learning rule 4) Widrow-Hoff Learning rule 5) Winner-take-all Learning rule	[05]
	OR	
Q2 (a)	Explain Mc-Culloch Pitts Model with suitable example.	[05]
Q2 (b)	Explain the training algorithm of ART1	[10]
Q3 (a)	Explain how the genetic algorithm can be used to solve a problem by taking a suitable example.	[10]
	OR	
Q3 (a)	Explain the working of the EBPTA with a suitable flowchart.	[10]



Shri Vile Parle Kelavani Mandal's

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Q3 (b)	Interpret the biological terminology into Ant colony Optimization.	[05]
Q4 (a)	Draw a flowchart for genetic algorithm. Explain each step-in detail.	[10]
	OR	
Q4 (a)	Describe in brief single solution particle swarm optimization algorithm	[10]
Q4 (b)	Discuss the validity of the following statement: "PSO is an EA."	[05]
Q5 (a)	Consider a population of strings with 10 bits each. The objective function can assume the number of 1's in a given string. The fitness function then performs "divide by 10" operation to normalize the objective function. Show computation of minimum of two generations. Assume crossover rate as 0.5 and mutation probability as 0.05.(Initial population size as 4)	[10]
Q5 (b)	Explain the Negative selection training technique in Artificial Immune systems	[05]
	OR	
Q5 (b)	Compare and contrast Supervised learning, unsupervised learning and reinforcement learning	[05]